EATING PATTERNS OF INDIAN PRESCHOOL CHILDREN BETWEEN 1-5 YEARS OF AGE IN HOWICK WEST (KWA-ZULU NATAL)

A Research Project thesis
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by

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Declaration

I, Fathima Bux, hereby declare that the work contained in this thesis is my own work and that all sources have been accurately reported and acknowledged, and that this document has not previously in its entirety or in part been submitted at any university in order to obtain an academic qualification.

2 October 2003

ABSTRACT

Most of the risk factors for coronary heart disease (CHD) such as hypertension, dyslipidaemia, smoking, non-insulin dependent diabetes mellitus (NIDDM), obesity, physical inactivity and heredity are common in South African populations, with Indians ranking among those with the highest prevalence in the country. Little published literature is available on eating patterns in pre-school children in the Indian population. Therefore, this study aims to assess the nutritional status of a group of Indian pre-school children in Howick West (a small suburb in the Kwa-Zulu Natal Midlands).

Methods: This was a cross-sectional study of 50 Indian pre-school children between the ages of 1-5 years, randomly selected from a total of 632 available Indian households in Howick West. Written, informed consent was obtained from the mother/caregiver of each child that participated in the study.

Standardized and validated 24-hour-recall (24-H-R) and quantitative food frequency questionnaires (QFFQ), used in the National Food Consumption Survey (NFCS) of 1999, were adapted and used to assess habitual intake and eating patterns of the 50 Indian pre-school children. Height and weight measurements using standardized methodology were used to assess the anthropometric status of the children.

Results: The prevalence of underweight was 14%. Stunting affected only 8% of the children, and 2% were at risk of overweight. The mean energy intakes of the children were above that recommended for age. A high fat intake was observed, with total fat contributing 42% to the daily total energy (TE) intake. The contributions of total carbohydrate and protein to TE intake were 45% and 10%, respectively. Low mean intakes of the following micronutrients were observed (less than 67% of the RDA): Calcium (22% of the children), Vitamin D (90%), Zinc (56%) and Iodine (90%), respectively. Based on the 24-H-R, the intakes of the remaining micronutrients were either above or equivalent to that recommended for age when compared to the 1989 RDAs.

Conclusions: Despite a relatively high prevalence of underweight compared to overweight in these preschoolers, dietary analysis has indicated adequate dietary intakes in terms of total energy recommended for the age groups studied. However, total fat intake which represented 42% of TE, was high, with saturated fat (SF) contributing 15% to TE intake. This finding is cause for concern as excessive consumption of dietary fat has been implicated in the aetiology of CVD, obesity and some forms of cancer, and CHD is one of the main causes of morbidity and mortality in South Africa, especially among the Indian segment of the population.

OPSOMMING

Meeste van die risikofaktore vir koronêre hartsiektes (KHS) soos hipertensie, dislipidemie, rook, nie-insulien afhanklike diabetes (NIADM), vetsug, fisiese onaktiwiteit en oorerflikheid, kom algemeen onder Suid-Afrikaanse bevolkingsgroepe voor, met Indiërs onder dié met die hoogste voorkoms in die land. Min gepubliseerde inligting is beskikbaar oor die eetgewoontes van voorskoolse kinders onder die Indiër bevolking. Die doel van hierdie studie was dus om die voedingstatus van 'n groep Indiër voorskoolse kinders in Howick Wes ('n klein voorstad in die Kwa-Zulu Natal Middellande) te bepaal.

Metodes: Dit was 'n dwarssnit studie van 50 voorskoolse Indiër kinders tussen die ouderdomme van 1-5 jaar, ewekansig geselekteer uit 632 beskikbare Indiër huishoudings in Howick Wes. Geskrewe en ingeligte toestemming is ontvang van die moeder/versorger van elke kind wat aan die studie deelgeneem het.

Gestandaardiseerde en gevalideerde 24-uur herroep (24-H-R) en voedsel frekwensie vraelyste (QFFQ) soos gebruik in die Nasionale Voedsel Inname Studie (NFCS) van 1999, is aangepas en gebruik om gewoontelike inname en eetgewoontes van die 50 Indiër voorskoolse kinders te bepaal. Lengte en gewig is m.b.v. standaad tegnieke bepaal om die antropometriese status van die kinders te evalueer.

Resultate: Die voorkoms van ondergewig was 14%. Dwerggroei het slegs 8% van die kinders geaffekteer en 2% het 'n risiko vir oorgewig getoon. Die gemiddelde energie inname van die kinders was hoër as wat aanbeveel word vir hierdie ouderdomsgroep. 'n Hoë vetinname is gevind, met 'n totale vet bydrae van 42% tot die daaglikse totale energie (TE) inname. Die bydrae van koolhidrate en proteïen tot TE was 45% en 10% respektiewelik. Lae gemiddelde innames van die volgende mikrovoedingstowwe is gevind (minder as 67% van die RDA): kalsium (22% van die kinders), vitamien D (90%), sink (56%) en jodium (90%), respektiewelik. Gebasseer op die 24-H-R, was die inname van die oorblywende mikrovoedingstowwe óf hoër óf gelyk aan wat aanbeveel word vir die betrokke ouderdomsgroep wanneer vergelyk word met die 1989 RDA.

Gevolgtrekkings: Ten spyte van 'n relatiewe hoë voorkoms van ondergewig in vergelyking met oorgewig in hierdie voorskoolse kinders, was dieetinname voldoende in terme van totale aanbevole energie vir die ouderdomsgroep. Totale vetinname, wat 42% van TE uitgemaak het, was egter hoog en versadigde vette het 15% van TE bedra. Hierdie verskynsel is 'n rede tot kommer aangesien oormatige vetinname reeds geïmpliseer is in die etiologie van KHS, vetsug en sommige vorms van kanker, en KHS is een van die belangrikste oorsake van morbiditeit en mortaliteit in Suid Afrika, veral onder die Indiër bevolking.

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Abbreviations

24-H-R-Q	24 hour recall questionnaire
QFFQ	Quantitative food frequency questionnaire
W/A	Weight-for-age
W/H	Weight-for-height
H/A	Height-for-age
BMI	Body mass index
BMI/A	Body mass index for age
SD	Standard deviation
TE	Total energy
SFA	Saturated fatty acids
MUFA	Monounsaturated fatty acids
PUFA	Polyunsaturated fatty acids
RDA	Recommended Dietary Allowances
CHD	Coronary heart disease
NIDDM	Non-insulin dependent diabetes Diabetes Mellitus

1. INTRODUCTION

Healthy eating habits are necessary for the normal growth and development of preschool children, and for the prevention of nutritional diseases later on in life. The eating habits developed at this age influence the development of chronic degenerative diseases later on in life. The diets of adult South African Indians have been shown to be characterized by high intakes of meat, total fat, and insufficient dietary fibre, with South African adult Indian males having a higher prevalence of risk factors for CHD when compared with other population groups. [1] Research from the Framingham study has shown that food habits that develop during childhood are maintained as children enter school, and the dietary choices of primary school children track into adolescence. [2] Coronary heart disease (CHD), which is one of the leading causes of mortality and morbidity in South Africa, with mortality rates that are amongst the highest in the Indian population in South Africa, necessitates the evaluation of eating patterns in the Indian population of South Africa, particularly in early childhood. [3,4]

Research indicates that the prevalence of obesity is increasing worldwide, even in developing countries (including South Africa), which have traditionally experienced high rates of undernutrition. It has been observed that countries in economic transition from an underdeveloped to a developed status, are especially affected, with an increasing prevalence of obesity across all economic levels and age groups. [5] De Onis and Blossner have shown that undernutrition in preschool children still remains the nutritional problem of greatest concern in developing countries. [6] However, increasing prevalence of overweight and obesity in many developing countries, including South Africa, is a cause for concern.

Childhood is a crucial time for understanding the causes of eating behaviours that may increase the likelihood of becoming overweight, since social and environmental influences form the basis for acquiring eating behaviours during this time. [2] Individual differences in the behavioural controls of food intake are evident in the preschool years. [7] They arise as genetic predispositions that are changed through experience with food and eating. [8] Achieving behavioural changes in adults that effect positive change (for example, achieving lasting weight reduction in an obese patient), has been found to be difficult and remains a challenge. [9] It is crucial to evaluate childhood eating patterns in populations at risk for CHD, and to provide appropriate nutritional intervention. [10]

2. OBJECTIVES

The objectives of the survey were:

2.1 Primary Objectives:

a) To determine the usual food consumption of pre-school children aged 1-5 years in Howick West.
b) To assess the usual nutrient intake of 1-5 years old pre-school children in Howick West.
c) To determine the anthropometric status of 1-5 years old pre-school children in Howick West.

2.2 Secondary Objectives:
To utilize the information obtained from the primary objectives to make recommendations for future research.

3. METHODOLOGY

3.1 Methods
This was a cross-sectional study in Indian children aged 1-5 years in Howick West. According to Umngeni Municipality records, there are 632 Indian households in the Howick West area. A minimum of 50 children was required for the study.

Sampling comprised two stages. The initial sample allowed for 100% oversampling to accommodate children who either might not be at home at the time of the survey; or for households which had no children between 1-5 years of age; or for individuals who might refuse participation in the survey.

Therefore, an initial sample of 100 households was obtained by drawing a random sample of lot numbers manually out of a box of 632 lot numbers representing the households. From this random sample of 100 households, 48 households did not have children between the stipulated age group of 1-5 years of age, and children from 3 households were not available to participate in the study. Four households were not included after drawing 4 random samples from 4 pairs of households that were in very close proximity to each other. A method of Snowball Sampling was carried out in order to make up the total number of 50 children required for the study. In this regard, the caregiver of each of the 100 households sampled was also asked if she/he knew of any other families with children between 1-5 years of age in the vicinity. The remaining children required to provide the minimum of fifty subjects was thus randomly selected from the twelve responses obtained.

A qualifying household was defined as any Indian household with at least one child, either male or female, aged between 3-5 years. If there was more than one child aged between 1-5 years in the same household, a "Random Numbers Table" was used to select one child in a given household to be included in the survey. Dates for home visits were set. All the required questionnaires were then completed, and the required anthropometric measurements were carried out.

3.2 Training
The researcher (dietician) used the training manual formulated for the National Food Consumption Survey (NFCS) in 1999 [11] as a means of training, which included exercises to ensure a comprehensive understanding of the requirements and objectives involved in the implementation of the study. The food technician from the Department of Dietetics and Human Nutrition from the University of Natal-Pietermaritzburg (PMB) provided the researcher with wax food models, a stadiometer, and assistance regarding the use of the food models. One week was spent in the training of quantification of food products, and carrying out of tasks as per training manual.

3.3 Questionnaires

An adapted form of the following questionnaires which were designed, tested, and validated for use in the National Food Consumption Survey (NFCS) in 1999 [11] were used in this study:

a) The Sociodemographic Questionnaire (SDG) (Appendix A)
provided information on factors relevant to the household (HH) regarding the environment in which the child lived.

b) The Quantitative Food Frequency Questionnaire (QFFQ) (Appendix B)
provided information on the intake and eating pattern of the child during the previous six months.

c) The 24-Hour Recall Questionnaire (24-H-RQ) (Appendix C)
provided information on the current diet and eating pattern of the child.

A special kit consisting of wax food models, household utensils, empty containers and a ruler were used for the quantification of food throughout the survey. The kit was obtained from the University of Natal (PMB).

3.4 Anthropometric assessment

Each subject's anthropometric measurements was taken by the researcher using standardized and internationally recognized methodology. The following measurements were taken:

- Height
- Weight

A portable SECA scale and a stadiometer obtained from the University of Natal (PMB) were used for the measurements. Weights were measured to the nearest 0.5kg using a calibrated SECA scale. Heights were measured to the nearest 0.1cm using a stadiometer. An average of three measurements was used.

Anthropometric data were expressed using percentiles for weight-for-age, height-for-age, weight-for height and BMI-for-age. The Centers for Disease Control and Prevention (CDC) growth charts released in the year 2000, served as the basis for determining anthropometric status (Table 1). [12]This table was used as a reference from the CDC Growth Charts. [12]

3.5 Validation

3.5.1 Repeatability

For the purposes of this study, repeatability meant the ability of the researcher to obtain as accurate information as possible from the same interviewee two weeks apart. Ten households were randomly selected. Two weeks after the initial interview, the researcher returned to each of these households to complete a 24-H-R, QFFQ and conduct anthropometric measurements a second time. A Cronbach's-alpha coefficient of 0.7 indicated good reliability of results obtained from the analysis of these questionnaires.

Table 1: Anthropometric index, percentile cutoffs and nutritional status indicator used to screen children in the CDC Growth Charts

Anthropometric Index	Percentile Cut Off Value	Nutritional Status Indicators
Weight-for-age BMI-for-age	>/= 95th percentile	Overweight
Weight-for-height	> 95th percentile	Overweight
Weight-for-age BMI-for-age	>/= 85th and < 95th percentile	At risk of overweight
Weight-for-age BMI-for-age Weight-for-height	< 5th percentile	Underweight
Height-for-age	< 5th percentile	Stunted

[12]

Descriptive statistical analyses were performed using the 'SPSS 11.0 for Windows' programme.

3.5.2 Validation

All questionnaires used were adapted forms of those used in the NFCS of 1999. Validation and repeatability studies were carried out in the NCFS, hence all the questionnaires used, were not validated further. [11]

3.6 Ethical Issues

The study proposal was approved by the Ethics Committee at the University of Stellenbosch. Written, informed consent (Appendix D) was obtained from the mother/caregiver of each child that participated in the study.

3.7 The Study

The study was carried out between September and December 2002. Each randomly selected household was visited by the researcher. Permission was obtained from the mother/caregiver regarding participation in the survey. Once a minimum of fifty subjects was obtained, a time was set for the interview, and the mother or caregiver of the child was interviewed in the following manner:

- Informed consent obtained
- Completion of sociodemographic questionnaire
- Conducted anthropometric assessment
- Completion of 24-H-R
- Completion of food frequency questionnaire

The researcher completed all the questionnaires. All interviews were conducted in English.

3.8 Data Analysis

- After completion of each interview, the questionnaires were checked thoroughly, before double-entry of data was carried out.
- The data was then entered, cleaned and analysed. The Medical Research Council's 'Foodfinder 3' programme in conjunction with the 'SPSS 11.0 for Windows' was used for data entry and analysis under the expert supervision of a statistician.

The following analyses were done:

a) Descriptive statistics (means, standard deviations, medians, ranges) and frequency distributions were calculated for all nutrients and food groups, for example:
Mean Macronutrient intake (Energy, protein, carbohydrate, total fat, saturated fat, monounsaturated fat, polyunsaturated fat, added sugar, fibre, calcium, magnesium, iron, zinc, selenium, vitamin A, vitamin B6, niacin, riboflavin, vitamin C, vitamin D, vitamin E).
Energy distribution of macronutrients and nutrient ratios [mean standard deviation(SD)].
Percentages of children not meeting 67% of the RDA [13] was also calculated.
Mean heights and weights were calculated. Weight-for-age (W/A), height-for-age (H/A), weight-for-height (W/H), and body mass index-for-age (BMI/A) analyses were calculated to determine the prevalence of under- and/or over-weight, and/or stunting.

Analyses were stratified by gender and age. To facilitate effective comparison with the Recommended Dietary Allowances (RDA's) – (1989), [13] the children were divided into 2 groups for dietary analysis: a). 1-3-year age group, and b). 4-5-year age group. This division into 2 groups was also used for anthropometric assessment.

b) Correlation analysis was also performed. Associations between nutrient, food and energy intakes and variables of age and gender were investigated. Correlation between nutrient intake and anthropometric status; for example: Investigating the correlation of energy intake with height and weight using Pearson's correlation analysis.

c) The independent t-test was used to compare the results of male versus female for nutrient intake for age. The height level of significance was set at $p < 0.05$.

d) A Cronbachs-alpha co-efficient was calculated as part of the reliability test to assess how valid the results were, and whether similar results would be obtained if the sample size were increased.

4. RESULTS

Fifty Indian children between 1-5 years of age from Howick West in the Kwa-Zulu Natal Midlands participated in this study. An even distribution by gender (50% males and 50% females) was present in the study sample. By age, the lower number of children was found in the 1-3 year age group, with a total of eleven children in this group (45% male and 55% female). The majority of the children (n=39) were present in the 4-5 year age group (51% male and 49% female).

The information for the completion of the questionnaires was in the greatest majority provided by the mother (90%) or a grandparent (10%) of the child and can therefore be considered reasonably reliable, within the specifications of the methodology employed.

In all 50 subjects, the same majority of household members were responsible for feeding the child and for food preparation.

4.1 Socioeconomic Demographics

The father was the head of the household in 92% of the households. In only 4% of the households (HHs) was the mother the head; and the grandparent, more commonly the grandfather, headed the household in the other 4% of households.

Figures 1 and 2 provide the percentages of fathers and mothers, respectively, that were unemployed, self-employed, and wage earners, including other sources of income such as disability grants. In approximately 78% of the HHs the father was a wage earner (Figure 1). The father was unemployed in only 2% of HHs, and receiving a disability grant in another 2% of HHs. Eighteen percent of the fathers were self-employed.

Six percent of the mothers were self-employed, 40% were wage earners, and 54% were unemployed; of which, approximately 76% were housewives by choice (Figure 2).
The majority of mothers (68%) had matriculated. Twenty percent completed standard 8 and only 10% obtained a tertiary education (Figure 3).

Figure 4 illustrates the monthly income in Rands of the households in Howick West. Eight percent of the households received a monthly income of R0 – R1999, and 32% received between R2000 – R3999. Most (46%) of the households fell into the lower-to-middle socio-economic bracket with an income of R4000 – R5999, whereas 14% of households received an income above R6000.

Ninety-four percent of the HHs had both a radio and television in working order, these being the most common means of receiving information (Figure 5).

In summary on the sociodemographic data, a large percentage (46% with an income between R4000-R5999) of the Indian population of Howick West in the Kwa-Zulu Natal Midlands fall under the lower-to-middle income class bracket [14], with the majority lacking tertiary education yet managing to live under adequate socio-economic conditions.

4.2 Anthropometric Status

The 50 children were divided into 2 mixed groups of males and females (1-3 year olds; and 4-5 year olds) for anthropometric assessment; because the numbers per gender were too small for a meaningful comparison.

The mean height of the entire group of 50 children was 1.03m (SD 0.08), and the mean weight was 14.9kg (2.6), with a mean age of 4.25 years (0.9). The mean heights and weights of all 50 children, and sub-divisions of boys, girls, and the two age groups are presented in Table 2.

According to Weight-for-age, 14% of the children were found to be underweight. Of the 14%, 43% (n=3) were male and 57% (n=4) were female; approximately 43% of these children were from the 1-3-year age group, with the remaining 57% from the 4-5 year age group. Figure 6 represents the percentile distribution of weight-for-age values in all 50 children.

Figure 7 represents the anthropometric status of Indian preschool children in Howick West in terms of Height-for-age (H/A), weight-for-age (W/A), weight-for-height (W/H), and Body mass index-for-age (BMI/A).

Stunting affected 8% of the children [5% (n=2) in the 4-5 year age group, and 18% (n=2) in the 3-year age group]. Stunting only affected the males. None of the children could be classified as overweight. However, 2% were at risk of overweight. No significant correlation (p = -0.2) could be found between level of maternal education and the prevalence of stunting. A weak correlation (p = 0.1) between height and energy and weight and energy (p = 0.1), was observed.

In summary, anthropometric findings of the study in Howick West based on weight-for-age indicate that about one in seven of the fifty Indian children interviewed, was underweight – the majority of the children being from the 4-5 year age group. A low BMI/A (almost 1 in 3) and lower W/H was also evident in the results obtained.

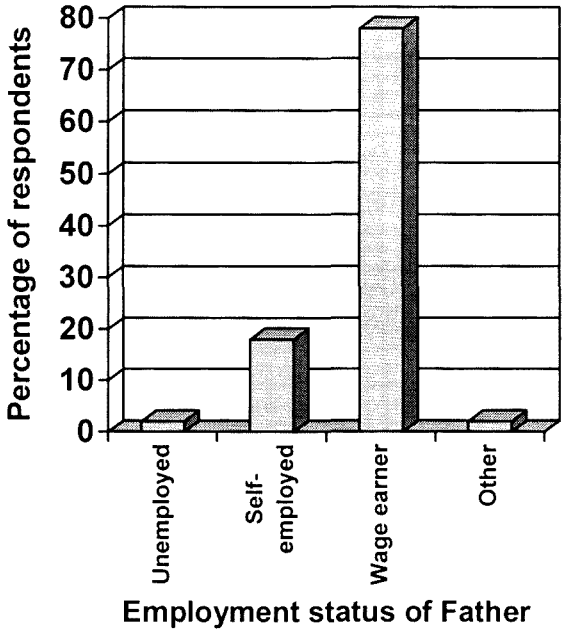

Figure 1: The employment status of the father in the household interviewed: Howick West 2002

Figure 2: The employment status of the mother in the household interviewed: Howick West 2002

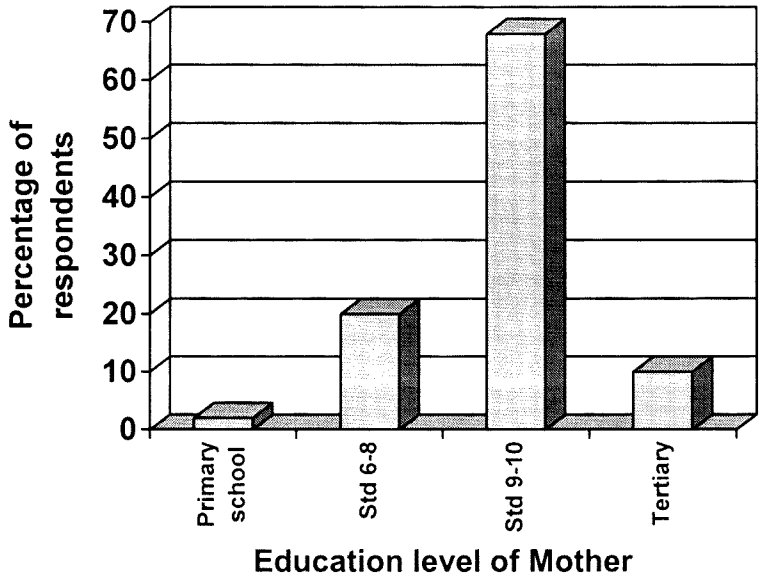

Figure 3: The education level of the mothers: Howick West 2002

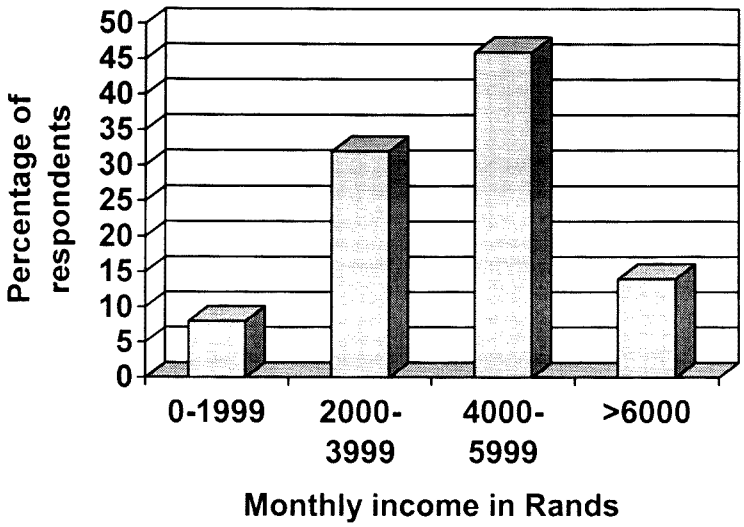

Figure 4: The percentage of households as a function of monthly income in Rands: Howick West 2002

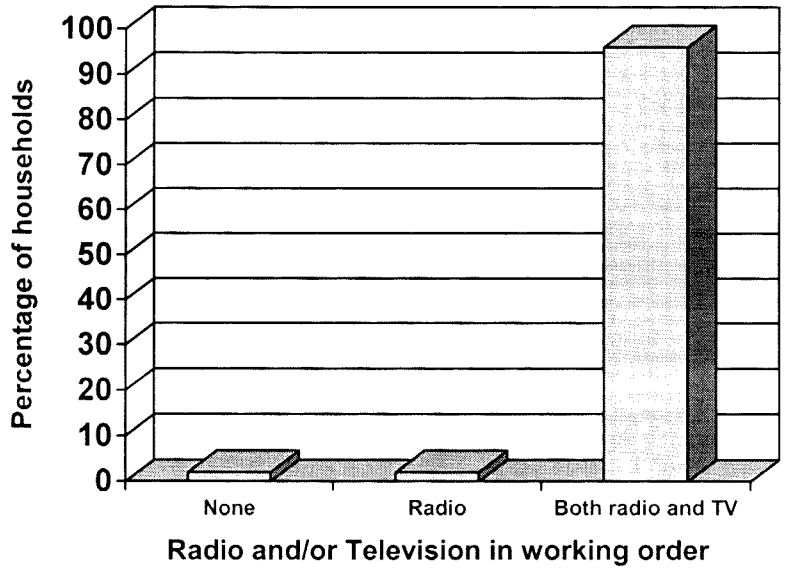

Figure 5: The percentage of households with a television and/or radio in working order: Howick West 2002

Table 2: Mean heights and weights of the Indian pre-school children in Howick West

	Mean height (m) (SD)	Range	Mean weight(kg) (SD)	Range
All 50 children	1.03 (0.08)	0.88-1.18	14.9 (2.6)	10.0-21.5
Boys	1.04 (0.08)	0.89-1.18	15.3 (2.4)	10.5-21.5
Girls	1.03 (0.07)	0.88-1.15	14.5 (2.8)	10.0-21.5
1-3 year age group	0.96 (0.05)	0.88-1.02	13.0 (1.8)	10.0-15.0
4-5 year age group	1.05 (0.07)	0.94-1.18	15.5 (2.5)	11.5-21.5

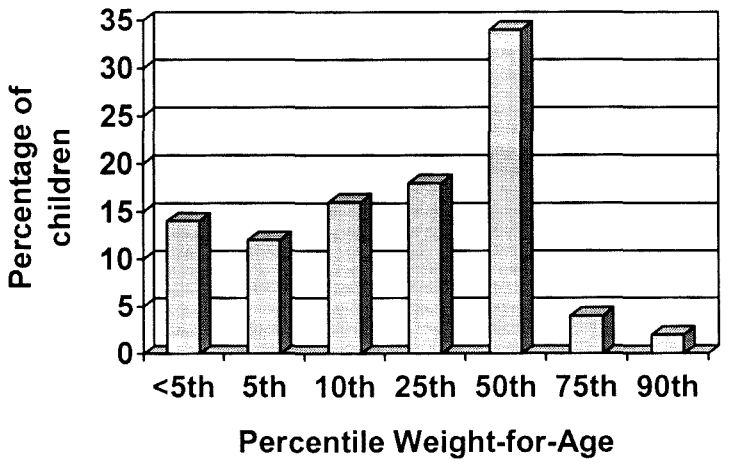

Figure 6: Percentile distribution of Weight-for-age values in all 50 Indian pre-school children: Howick West 2002

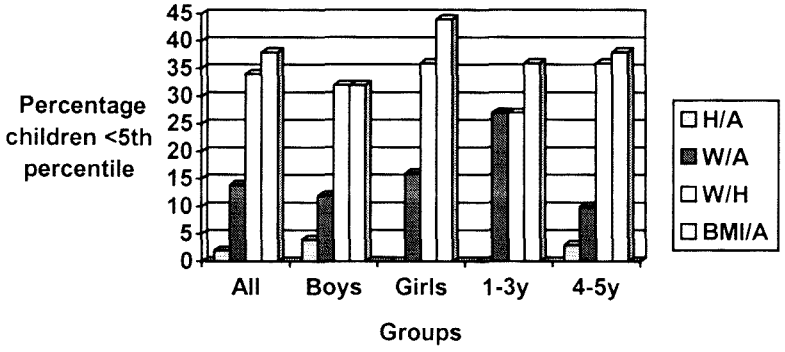

Figure 7: The anthropometric status of children aged 1-5 years by age and sex in comparison to all 50 subjects: Howick West 2002

4.3 Macronutrient Intake:

A Cronbach's alpha value of 0.8 was obtained for nutrient intake. This indicated good reliability of results obtained from the analysis of the 24-hr recall questionnaire and QFFQ in this study.

On the basis of the 24-H-RQ and quantitative food frequency questionnaire (QFFQ – in brackets) analysed by sex and age, the mean energy intake of the 50 subjects was 8727kJ (9156kJ). This was above that recommended for age. The mean energy intakes of the males and females were also above that recommended for age. These were 9508kJ (9942kJ) and 7947kJ (8369kJ), respectively. The mean energy intake of the 1-3 year age group was 8138kJ (7426kJ); and the 4-5 year age group was 8900kJ (9644kJ). A comparison of the percentage mean energy distributions of macronutrients and standard deviations is illustrated in Table 3.

The mean total protein intake of 10% of TE of the 50 subjects was also above that recommended for age. The mean total protein intake for the 1-3-year olds, and 4-5 year olds, was 10% of TE for each group. A higher mean total protein intake in males versus females was noted ($p = 0.02$), with intakes of 11% of TE and 10% of TE, respectively. This was also true for mean intakes of total fat and total carbohydrate, which were 42% of TE and 45% of TE, respectively. The higher mean intakes observed in males versus females were 43% of TE versus 41% of TE for total fat, and 48% of TE versus 42% of TE for carbohydrate, respectively. A comparison of the mean intakes of total protein, fat and carbohydrate is illustrated in Table 3. A significant correlation between animal protein and total fat (Pearson's: $r = 0.9$; $p = 0.000$) was observed.

Plant protein represented 4% of TE intake, compared with 6% from foods of animal origin. The former represented 37% of total protein intake whereas animal protein represented 63%; a significantly higher intake of animal protein by all of the children (Pearson's: $r = 0.5$; $p = 0.001$) (Figure 8). An inverse relationship between animal protein consumption and stunting was observed (Pearson's: $r = -0.8$; $p = 0.4$).

According to the 24-hr recall; SFA represented 15% of total energy intake; whereas MUFA and PUFA represented 12% and 11% respectively. These values exceed the recommended intakes of 10% each of SFA, MUFA and PUFA of TE intake (Figure 9). A significant correlation was observed between SFA and total fat (Pearson's: r = 0.9; p = 0.000), as well as between cholesterol and total fat (Pearson's: r = 0.7; p = 0.000). A significant correlation was also found between energy intake and stunting (Pearson's; r = 0.5; p = 0.01).

4.3.1 Distribution of Energy

Figure 10 compares the energy distribution of the diet between the 24-hr recall and QFFQ. Total fat as a percentage of the total energy intake (TE), was 42% on the basis of the 24-H-RQ (41% - QFFQ). On a similar basis, the protein contribution to TE was 10% (12%), and carbohydrate contribution was 45% (45%). Total fat, which represents 42% of TE exceeds the recommended 30% of TE (Figure 10).

Results from the QFFQ were similar or higher than those obtained from the 24-hr recall questionnaire (Table 3).

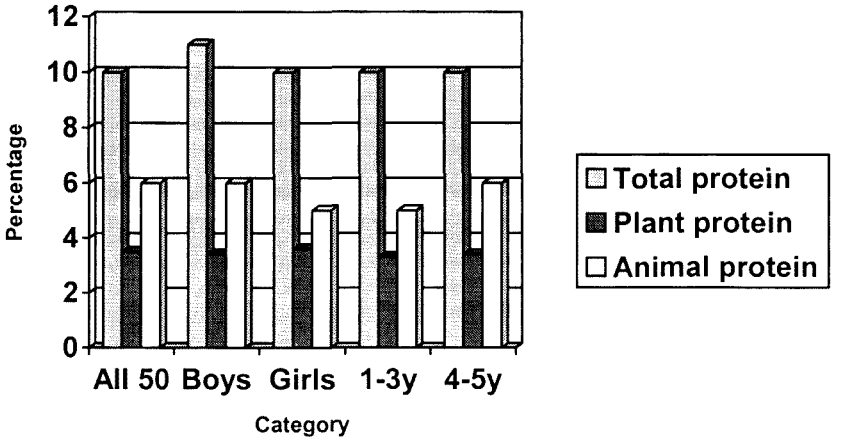

Figure 8: Contribution of total protein, plant protein, and animal protein to TE in pre-school children in Howick West (n=50): (24-H-RQ)

Table 3: The average energy distribution of macronutrients and nutrient ratios [SD]: Howick West 2002

	All 50		**Boys**		**Girls**		**1-3y**		**4-5y**		**RDA**
	24HR	QFFQ	24HR	QFFQ	24HR	QFFQ	24HR	QFFQ	24HR	QFFQ	
Energy intake (kJ) (SD)	8727 (2808)	9155 (2896)	9508 (3210)	9942 (2842)	7947 (2127)	8369 (2786)	8138 (1641)	7426 (1864)	8900 (3053)	9644 (2965)	7531
Median (kJ)	8475	8668	9096	9424	7939	7778	8474	6787	8477	8806	
Total Prot (%E)	10 (4.5)	12 (4.5)	11 (4.0)	12 (4.1)	10 (3.5)	12 (4.8)	10 (3.0)	11.5 (3.4)	10 (4.0)	12 (4.5)	5
Median (g)	52	58	60	62	47	52	51	49	55	59	
Plant Prot (%E)	3.5 (1.5)	3.7 (1.5)	3.4 (1.5)	3.5 (1.2)	3.6 (1.4)	3.8 (1.8)	3.3 (1.3)	3.6 (1.1)	3.4 (1.5)	3.6 (1.6)	
Median (g)	17	18	19	20	16	15	14	15	19	19	
Animal prot (%E)	6 (4)	7 (4)	6 (4)	7 (4)	5 (3.5)	7 (4)	5 (3)	7 (3)	6 (4)	7 (4)	
Median	27	36	30	38	24	36	25	32	28	39	
Total fat (%E)	42 (17)	41 (17)	43 (19)	42 (16)	41 (14)	39 (16)	41 (13)	38 (12)	43 (18)	41 (17)	30
Median (g)	88	92	103	99	84	85	86	67	89	93	
SFA (%E)	15 (9)	13 (7)	15.5 (9)	13 (7)	15 (7)	13 (6)	14 (6)	12 (5)	15 (9)	13 (6)	10
Median (g)	29	29	30	33	29	28	25	23	32	32	
MUFA (%E)	12 (6)	13 (7)	12 (6)	14 (7)	12 (5)	12 (6)	11 (4)	11 (4)	12 (6)	14 (7)	10
Median (g)		27		30		24		24		30	
PUFA (%E)	11 (5)	11 (4)	11 (4)	11 (3)	11 (5)	11 (4)	11 (4)	11 (5)	11 (5)	11 (3)	10
Median (g)	25	27	29	28	20	22	26	18	25	27	
CHO (%E)	45 (15)	45 (13)	48 (15)	44 (11)	42 (14)	46 (14)	47 (11)	47 (11)	44 (14)	45 (12)	45-60
Median (g)	231	231	240	260	222	209	238	207	231	249	

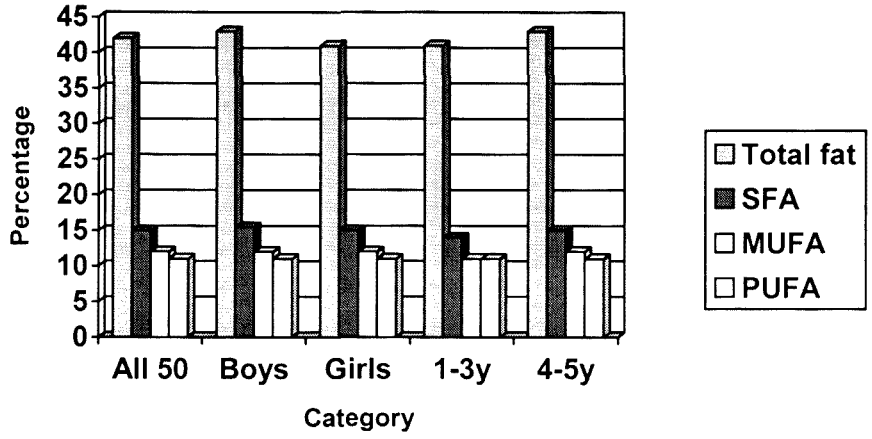

Figure 9: Contribution of total fat, SFA, MUFA, and PUFA to TE in pre-school children in Howick West (n=50): (24-H-RQ)

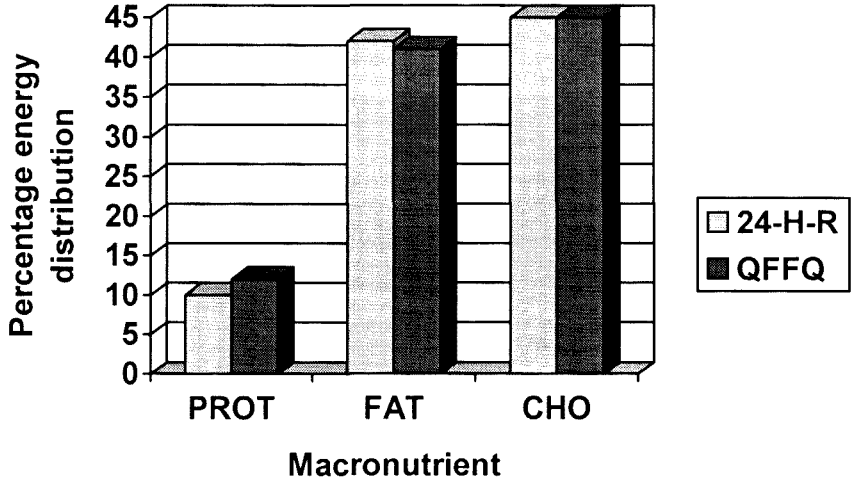

Figure 10: Percentage energy contribution of total protein (PROT), total fat, and carbohydrate (CHO) to total energy intake (TEi) in pre-school children in Howick West: 24-H-RQ versus QFFQ (n=50)

4.4 Micronutrient intake

4.4.1 Vitamins

4.4.1.1 Vitamin A:

Eighty two percent of the children in the 1-3-year olds age group had intakes above the RDA, compared to 74% in the 4-5 year age group. The mean Vitamin A intake in the 1-3-year and 4-5 year olds age groups were both above the RDA, with intakes of 540mcg (235) and 680mcg (357), respectively (Table 4). Twenty one percent of the children in the 4-5 year olds age group did not meet 67% of the RDA for vitamin A, as compared to 9% in the 3-year olds age group (Figure 11).

4.4.1.2 Other Vitamins

The mean intakes of Vitamins E and K were 18.5mg (7.9) and 28.5mcg (34), respectively. These values are well above the recommended intake for age. However, the mean intake of Vitamin D was quite low, with values of 2.7mcg (1.1) and 3.3mcg (2.5) for the age groups 1-3 years and 4-5 years, respectively (Figure 12). Eighty seven percent of the children in the 4-5 year olds age group, and all the children in the 1-3-year age group did not meet 67% of the RDA requirement for vitamin D. However, it should be noted that vitamin D is usually derived from sunlight. Table 4 includes the mean intakes of those vitamins whose intake was lower than that recommended. Eighteen percent from the 1-3-year olds group and 28% from the 4-5 year olds age group did not meet 67% of the RDA requirement for vitamin C.

The mean intakes of all the other vitamins were above the recommended intakes for age.

Independent t-tests indicated significant differences between the males and females in their mean intake of folate ($p = 0.01$) and vitamin E ($p = 0.03$). There were also significant differences between the mean intake of the 1-3 year age group and the RDA with respect to the mean intake of total protein ($p = 0.000$), Mg ($p = 0.036$), Vit B12 ($p = 0.001$), Vit E ($p = 0.000$), Vit K ($p = 0.091$), Vit D ($p = 0.000$), and folate ($p = 0.001$). Independent t-tests revealed significant differences between the mean intake of the 4-5 year group and the RDA for Vit E ($p = 0.000$), Vit C ($p = 0.020$), Vit D ($p = 0.000$), folate ($p = 0.000$), total protein ($p = 0.033$) and Cu ($p = 0.015$).

Table 4: Comparison of mean intakes of vitamins in the different categories [SD] of children: Howick West 2002

Vitamins	**All 50**		**Boys**	**Girls**	**1-3y**	**RDA 1-3y**	**4-5y**	**RDA 4-5y**
	24H RQ	QFFQ	24H RQ	24H RQ	24H RQ		24H RQ	
Vit B6 (mg)	1.4 (0.8)	1.7 (0.7)	1.6 (0.8)	1.2 (0.8)	2.3 (0.8)	1.0	1.4 (0.8)	1.1
Folate (mcg)	210 (104)	250 (98)	249 (118)	171 (72)	187 (88)	50	217 (109)	75
Vit B12 (mcg)	3.5 (2.1)	3.4 (1.9)	4.0 (2.3)	2.9 (2.0)	3.4 (1.9)	0.7	3.5 (2.2)	1.0
Panto thenate (mg)	3.9 (1.8)	6.0 (2.7)	4.1 (1.8)	3.8 (1.6)	25.4 (1.4)	3.0	4.0 (1.9)	3.5
Biotin (mcg)	19 (9)	26 (12)	21 (9)	17 (8)	18.4 (6)	20	19.0 (10)	25
Vit C (mg)	81 (101)	118 (71)	83 (66)	79 (128)	70 (48)	40	84 (118)	45
Vit D (mcg)	3.2 (2.2)	2.9 (2.6)	3.3 (2.2)	3.1 (2.5)	2.7 (1.1)	10	3.3 (2.5)	10
Vit E (mg)	18.5 (7.9)	16.4 (5.3)	20.8 (8.2)	16.1 (6.9)	17.0 (7.0)	6.0	18.8 (8)	7.0
Vit K (mcg)	28.5 (34)	33 (26)	34 (41)	23 (26)	25 (21)	15	29 (38)	20

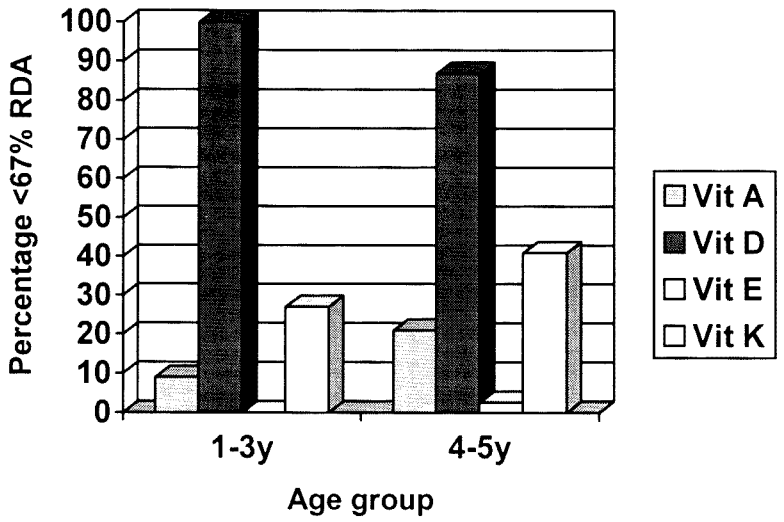

Figure 11: Percentage of Indian preschool children not meeting 67% of the RDA requirements for fat-soluble vitamins A, D, E, and K: Howick West 2002: (24-H-RQ)

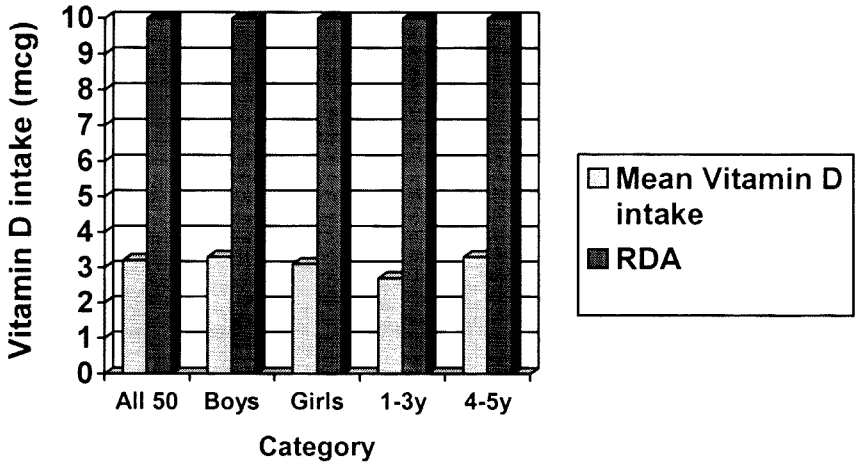

Figure 12: Comparison of actual and recommended intakes of Vitamin D in Indian pre-school children in Howick West: (24-H-RQ)

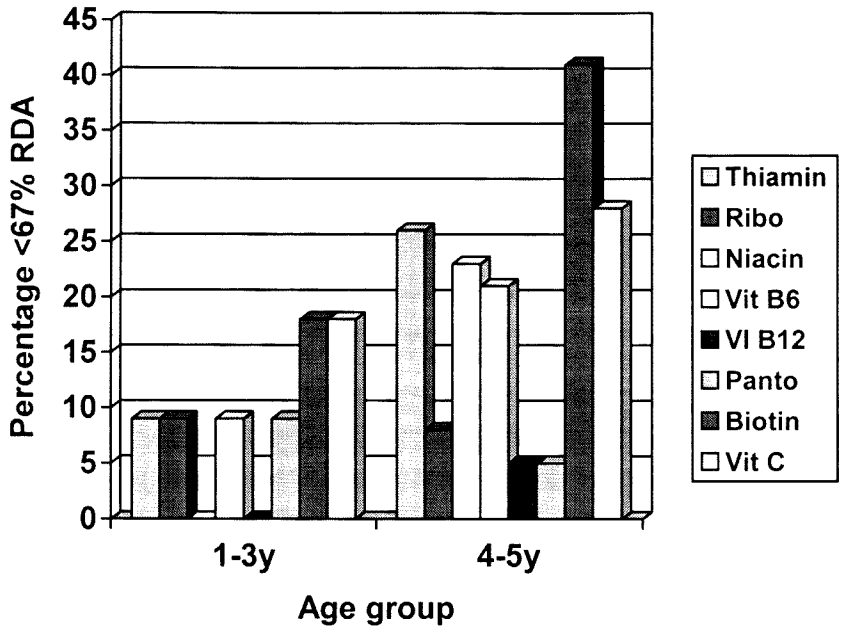

Figure 13: Percentage of Indian preschool children not meeting 67% of the RDA requirements for water-soluble vitamins: Thiamin, riboflavin, niacin, Vit B6, Vit B12, pantothenate, biotin, and Vit C: Howick West 2002: (24-H-RQ)

4.4.2 Minerals and Trace Elements

4.4.2.1 Calcium

The mean calcium intake was less than half of that recommended in only 22% of the children. The mean intakes in the 1-3-year and 4-5 year age groups were 742mg(SD 390) and 674mg(304), respectively (Table 5). These values were below that recommended for age. In the 1-3 year age group, 36% of the children did not meet 67% of the RDA, compared to 18% in the 4-5 year age group (Figure14).

4.4.2.2 Iron

The mean intake of iron was almost equivalent to the recommended intake for age. However, 50% of the children had an intake below that recommended for age. Two children in the 1-3 year age group did not meet 67% of the RDA requirement for iron. Thirty six of the children in the 4-5 year age group did not meet 67% of the RDA for iron (Figure 14).

4.4.2.3 Zinc

The mean zinc intake of 7.0mg in both age groups was slightly below the RDA of 10mg. Sixty-four percent of the children in the 1-3 year age group did not meet 67% of the RDA, whereas 54% of the children in the 4-5 year age group did not meet the RDA requirement (Figure 14).

4.4.2.4 Iodine

The mean intake of iodine in the 1-3 year age group was 22mcg(SD 13), and 26mcg(16) for the 4-5 year age group. This was well below the recommended intakes of 70mcg and 90mcg for the 1-3 year age group and the 4-5 year age group, respectively. Ninety percent of the children did not meet 67% of the RDA requirement for iodine in both the 1-3 year and 4-5 year age group (Figure 14). This

result could be an underestimate of actual intake as recipes for curries from Foodfinder 3 did not include salt fortified with iodine.

The findings on the nutrient intake as obtained by the QFFQ were largely very supportive of those obtained by the 24-H-RQ. However, absolute values of nutrient intake was higher when obtained by the QFFQ, but not significantly so.

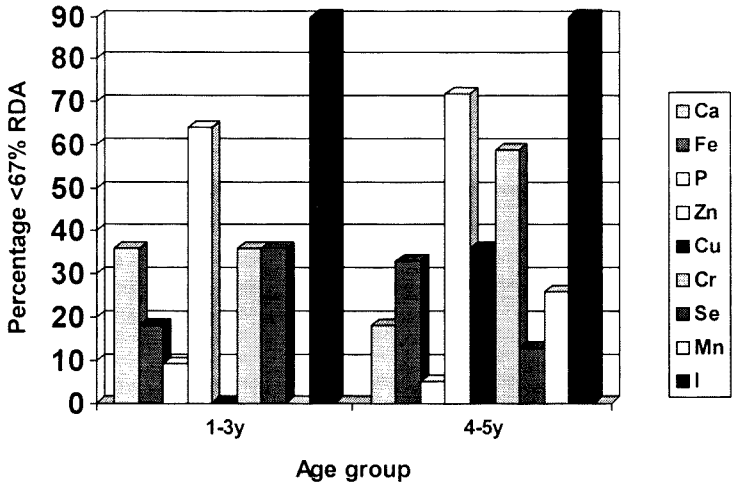

Figure 14: Percentage of Indian preschool children not meeting 67% of the RDA requirements for the mineral and trace elements calcium (Ca), iron (Fe), phosphorous (P), zinc (Zn), copper (Cu), chromium (Cr), selenium (Se), manganese (Mn), and iodine (I): Howick West 2002: (24-H-RQ)

4.5 Commonly consumed foods

The frequency of foods eaten by preschool children in Howick West was calculated using the 'SPSS 11.0 for Windows' programme. The meal time was crosstabulated with the food group. The following five food groups were most frequently consumed:

1. Cereals and cereal products
2. Sugar, syrups, sweets
3. Milk and milk products
4. Fats and oils
5. Vegetables

Figure 15 Denotes the frequency of foods and food products eaten by the group; not necessarily the quantities; for example: milk is consumed at a frequency of 147 times in one day (as per 24-H-R); but this includes the addition of milk in tea as well as whole milk consumed. Thus, even though milk is the third most frequently consumed food, calcium levels just below those recommended for age may indicate inadequate quantities of milk consumed by these preschoolers.

Table 5: Comparison of mean intakes of mineral and trace elements in the different categories [SD] of children: Howick West 2002

Minerals	**All 50**		**Boys**	**Girls**	**1-3y**	**RDA 1-3y**	**4-5y**	**RDA 4-5y**
	24H RQ	QFFQ	24H RQ	24H RQ	24H RQ		24H RQ	
Ca(mg)	689 (326)	719 (415)	715 (324)	664 (331)	742 (390)	800	674 (304)	800
Fe(mg)	9.3 (4.2)	9.6 (3.9)	10.4 (4.4)	8.2 (4.0)	9.9 (3.6)	10	9 (4.4)	10
Mg(mg)	193 (70)	231 (87)	205 (67)	182 (67)	188 (67)	80	195 (71)	120
P(mg)	904 (349)	988 (389)	965 (340)	843 (323)	888 (352)	800	908 (348)	800
Zn (mg)	7.1 (3.5)	8.1 (3.4)	8.4 (3.8)	5.8 (2.5)	7.1 (3.5)	10	7 (3.5)	10
Cu(mg)	0.90 (0.3)	1.16 (0.5)	0.99 (0.3)	0.81 (0.2)	1.5 (0.2)	0.85	0.92 (0.3)	1.25
Cr (mcg)	46 (34)	69 (36)	54 (28)	39 (37)	47 (46)	50	46 (30)	75
Se(mcg)	30 (17)	44 (24)	35 (18)	25 (15)	20 (12)	20	33 (18)	20
Mn (mcg)	1649 (709)	1796 (791)	1696 (764)	1603 (717)	1250 (766)	1250	1675 (689)	1750
I(mcg)	25 (16)	33 (19)	29 (16)	21 (16)	22 (13)	70	26 (16)	90
Vit A (mcg)	650 (327)	1200 (880)	739 (438)	560 (276)	540 (235)	400	680 (357)	500
Thiamin (mg)	0.9 (0.4)	1.1 (0.5)	1.0 (0.4)	0.8 (0.4)	1.5 (0.4)	0.7	0.9 (0.4)	0.9
Ribo flavin (mg)	1.7 (1.5)	1.7 (1.0)	1.9 (2.0)	1.5 (0.8)	2.8 (0.9)	0.8	1.7 (1.7)	1.1
Niacin (mg)	13.4 (7.0)	17.4 (7.3)	15.2 (6.7)	11.7 (6.5)	21.5 (6.0)	9.0	13.5 (7.4)	12.0

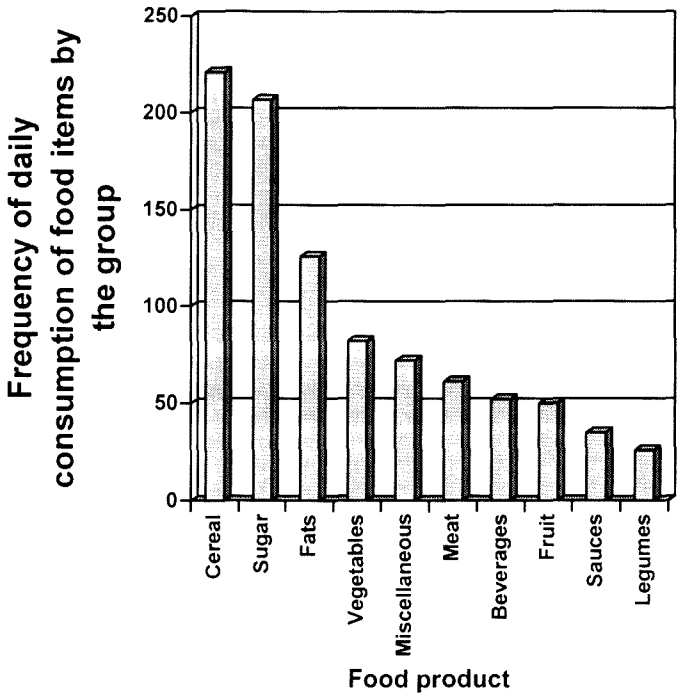

Figure 15: The foods most frequently eaten by Indian preschool children in Howick West (n=50): (24-H-RQ)

5. DISCUSSION

Reports of studies on eating patterns in Indian preschool children are few and far between. The 14% prevalence of underweight in the Indian preschool children reported in this study, is not significantly different from the findings of the NFCS of 1999 (10% prevalence of underweight). Of particular relevance is the decreased prevalence of stunting (8%) in this study compared to the NFCS (20%). Based on the results of the present study, it would appear that underweight emerged as being more prevalent in this group of Indian preschool children than stunting.

The Centers for Disease Control and Prevention (CDC) growth charts released in the year 2000, served as the basis for determining anthropometric status. For children, the distribution of BMI varies by age, therefore, the reference data are age-specific. Commencing at the age of 2 years, BMI tends to first fall and then rise again. This trend was observed in this study of preschool children from Howick West – perhaps contributing to the 14% prevalence of underweight. The associations with weight and stature are stronger at younger ages. Weight-for-stature percentiles tend to be lower than BMI-for-age percentiles. This was strongly observed in this study, where BMI/A was much higher (almost 1 in 3), and W/H tended to be lower. Therefore, children are less likely to be classified at risk of overweight or overweight on the basis of weight-for-stature, than they are on the basis of BMI-for-age; but more likely to be classified as underweight or at risk of underweight – as was evident in the children in this study. The overall agreement between the two has been found to be poorer at the ages of 4 and 5 years, than the ages of 2 and 3 years. [15] In this study, 8% of the children who were underweight were from the 4-5 year age group, compared to 6% from the 1-3 year age group.

In the years preceding 5 years of age, BMI values have been found to decrease because children grow in length faster than their weight increases. This decrease ends somewhere between 5 and 7 years of age, and BMI starts to increase – this is termed 'adiposity rebound.' Adiposity rebound is therefore defined as the age at which this turning point or increase occurs in the BMI-for-age curve. Research indicates that the earlier the age of adiposity rebound, the more likely an individual will be overweight in early adulthood. [16]

According to Scholtz et al, the diets of Indians in South Africa are characterized by high intakes of meat, total fat, and insufficient dietary fibre. [17] Findings in this study of Indian preschool children also revealed such overconsumption, particularly of high-fat products and red meat, that may predispose Indian children to a higher incidence of many chronic diseases in adult life. Further research indicates that despite recent decreases in the prevalence of CHD, this disease still remains a major killer in the South African Indian population. [17] Evidence from research indicating the role that dietary fat plays in the development of CHD, obesity and cancer; emphasizes the need to follow a diet in which individuals 'eat fat sparingly.' [1]

The amount of fat ingested has been shown to be a facilitating or causal factor in the deposition of body fat. Atkin and Davies [18], in their research at attempting to determine if diet composition is related to percentage body fat in children between 1.5 and 4.5 years found that the relation between fat intake and body fat may develop over time, and may not be evident in preschool children. [18] Also, energy expenditure (EE), especially physical activity, can affect body composition in early childhood. [19] This may explain the 14% prevalence of underweight in this sample of preschool children from Howick West, whose diets indicated total energy and macronutrient intakes equivalent to, or above that recommended for age. Under-representation of the younger age group (n=11) may have resulted in data not as representative for that specific age group.

Research reviewing the nutritional status of South Africans from 1975-1976, illustrated that total fat intake in Indian, coloured and white South Africans exceeded the recommended 30% of daily energy. Furthermore, large epidemiological studies conducted in South Africa have indicated that the meat group (comprising red meat, fish, chicken and meat products), followed by the fat group (consisting of margarine, butter, oil and animal fat), was found to be the major contributors of fat in the diet. In the present study, the fats and oils as a food group, ranked fourth in the frequency of foods eaten, and the meat group ranked eighth. A high total fat intake (42% of total energy) indicated that the quantities consumed by these Indian preschool children (all >2 years of age), together with those of red meat and meat products, were quite large (that is, 12% above the recommended 30% of TE). In keeping with previous research findings; in the Indian diet, the most commonly used method of food preparation is frying in fats (butter, ghee, margarine or a combination of these) and oils (particularly vegetable oils), resulting in a high-fat diet. The PUFA : SFA ratio has also been shown to be high – in this study; 0.7 to 1.0. The majority of subjects consumed brick margarine. Tub margarine was consumed to a lesser extent. [1]

Food preferences and dislikes, particularly intake patterns develop early in childhood and track throughout life. Research into child-feeding practices has shown that mothers' child-feeding practices are linked directly with children's food preferences,

energy intake, ability to regulate food intake according to the internal cues of hunger and satiety, and body weight. [10]

As diet in childhood affects eating in adulthood, high meat and fat consumption that tracks into adulthood, will increase the risk of colorectal, breast and uterine cancers in adulthood. [20] A diet high in carbohydrates, that include cereal and wholegrain foods, as well as fruit and vegetables, can be protective against these type of cancers. [21]

Indian South Africans have been found to have the lowest intakes of carbohydrates (even less than white South Africans who are third lowest), compared with other population groups in South Africa. This was observed in this study conducted on preschool children in Howick West. The carbohydrate contribution to total energy was 45%. An increase in carbohydrate intake to about 55% of TE is needed in these Indian preschool children to influence health and prevent disease. Literature suggests that dietary carbohydrate, as a percentage of energy intake, is inversely related to body fat. [18]

In the NFCS of 1999, it was found that the dietary intake of micronutrients such as calcium, iron, zinc and B vitamins by South African school children was less than 67% of the RDAs. [11] This group of Indian preschoolers had inadequate calcium and vitamin D intakes. Intakes of iron, zinc and the B vitamins by these children from Howick West were just about or below that recommended for age.

Butte [22] observed that energy requirements of infants and children vary greatly, because of variations in growth rate and physical activity. A child's energy requirements for growth are highest in infancy. A slower growth rate is seen in preschoolers, where activity levels are high and appetite and food intake are found to be erratic. Hence, the need for energy-dense foods in meeting the requirements of young children. [22]

6. CONCLUSION

It is evident, that the habitual intake of macro- and micronutrients in the Indian preschool children between 1-5 years of age in Howick West, are not optimal. High intakes of high-fat foods and meat products, excessive consumption of plant-based oils, hard margarine, and fried foods, and relatively low carbohydrate (45% of TE) intakes. This pattern of eating, together with increased incidences of chronic degenerative lifestyle diseases (such as, CHD, NIDDM, hypertension, hypercholesterolaemia and obesity) in adulthood amongst South African Indians, emphasize the need for effective nutritional intervention in the early years of life. [7,17]

6. RECOMMENDATIONS

South African Indians who consume a high fat diet (as observed in this study of Indian preschool children), should be encouraged to lower their fat intake, and to make the correct choices in terms of the types of fats they ingest. Nutritional intervention strategies aimed at healthy eating in young South African children need to include education on social awareness of nutrient needs to mothers and caregivers

in particular, because most individuals develop their eating and activity patterns in early childhood. The challenge, therefore, is to aim for 'optimal diets' and nutrient intakes of all South African children, to decrease the incidence of chronic degenerative lifestyle diseases in adulthood. [1,17]

a) Make starchy foods the basis of most meals [21]

An increase in the consumption of starchy foods amongst Indians is recommended, so as to replace some animal-derived and high-fat foods normally consumed in the diet. This will then lead to a decreased intake of fat and animal protein. In addition, increased consumption of fibre, resistant starch, and associated plant substances will decrease the risk of chronic degenerative diseases that are prevalent amongst the Indian community, such as, CHD, NIDDM, stroke, and certain types of cancer. Research suggests that Indian South Africans should increase their consumption of cereals and grains, especially in an unprocessed or minimally processed form, to obtain the beneficial effects of foods rich in carbohydrates. South Africa produces sufficient amounts of maize, rice and bread, to which the addition of legumes, vegetables and small amounts of animal-derived foods, can form the basis of an adequate diet. Variety can be added to the diet by the wide range of different cereals and grains and their products (such as breads, porridges, breakfast cereals, pastas), and rice, maize, wheat, sorghum and rye available on the market. [21]

b) BMI Monitoring for the first five years of life

A potential tool for identifying children at risk of obesity lies in the identification of the age at which adiposity rebound occurs. This technique involves the tracking of a child's BMI over the first years of life. Detection of individuals at high risk of obesity during early childhood may assist in establishing healthy lifestyles, and prevent the development of obesity before critical periods for its onset; that is, the adiposity rebound, which takes place between the ages of 4 and 6 years. [23]

c) Prevention measures of inactivity and unhealthy eating

Most individuals develop their eating and activity patterns during childhood. [24] Preventive measures targeting children in early childhood, particularly to mothers and caregivers, may be one long-term approach to dealing with nutritionally-related problems later on in life. In this study, education to mothers and caregivers on the importance of a nutritionally-balanced diet, and ways in which fat intake can be reduced, may provide a foundation in these Indian preschool children for lifelong healthy eating habits. Research has shown that television watching is a major cause of inactivity in children, and has been linked to obesity in childhood. Therefore, decreased television viewing and increased physical activity must be encouraged in young children. [2]

d) Healthy food preparation and eating fats sparingly

Mothers and other individuals responsible for food preparation need to be discouraged from frying foods, or utilizing large amounts of plant-based oils, butter, ghee, hard margarine, or a combination of these. Indian South Africans have higher PUFA intakes – at the expense of MUFA. [1] Oils with a high MUFA content (for example; olive oil) can be used instead – however, these are expensive in South Africa, and at present, perhaps not a practical option. Avocados are a good source of MUFA, and can be included in the diet. Two to three fish dishes per week, preferably dark fatty fish (such as tinned pilchards) are healthy and economical options. [15] The guideline

'to eat fats sparingly' is based on scientific evidence, and should be adhered to. The type of fat consumed is also important. A moderate-fat diet with a low SFA and high MUFA content should be followed, as these have a beneficial effect on lipid profiles[1].

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9. APPENDICES

Appendix A: Socio-demographic questionnaire (SDG)

EATING PATTERNS SURVEY IN INDIAN CHILDREN 1-5 YEARS OF AGE IN HOWICK WEST – KWA-ZULU NATAL

SOCIO-DEMOGRAPHIC QUESTIONNAIRE

Subject number :
Birth Date :
Interview Date :

Child's name: ..... Gender ... **M** ☐ **F** ☐

Address: ..... Religion: .....
.....
Tel no (H): ..... (W).....

Check that none of the following is true in this household:

1. Death in the family in the past 3 weeks.
2. Acute illness of child (within past 48 hours).
3. Caregiver not available.
4. Caregiver mentally incapacitated.
5. Caregiver under the influence of alcohol.
6. Child away from home for past 24 hours.
7. Caregiver younger than 12 years old.
8. Child does not eat and sleep at this house for 4 or more days a week.

Has the caregiver been looking after the child for less than 3 months? YES ☐ NO ☐

1. Relationship to child:
   Mother☐ Father ☐ Grandparent ☐ Sibling ☐ Aunt/Uncle☐ Other ☐

2. Marital status of mother

1	2	3	4	5	6	7	8
Unmarried	Married	Divorced	Separated	Widowed	Living Together	Traditional Marriage	Other Please specify

Tick one block only for every question:	Father	Mother	Sibling	Grandma	Grandpa	Aunt	Uncle	Cousin	Friend	Other
3. Who is mainly responsible for food preparation in the house?	1	2	3	4	5	6	7	8	9	10
4. Who decides on what types of food are bought for the household?	1	2	3	4	5	6	7	8	9	10
5. Who is mainly responsible for feeding/serving the child?	1	2	3	4	5	6	7	8	9	10
6. Who is the head of this household?	1	2	3	4	5	6	7	8	9	10

Now look at this child and tick one block only for every question.

7. Would you consider this to be a healthy child?	1 Yes	2 No	If no, specify:
8. Is this child disabled?	1 Yes	2 No	If yes, specify:

Tick one box:

9. Does the child's home have a **working**: i. Refrigerator/Freezer	1 Fridge	2 Freezer	3 Both	4 None
ii. Stove	1 Yes	2 No	If yes, choose one Gas/Coal/ Electricity	If yes, choose one With oven/ Without oven
iii. Primus or Paraffin Stove	1 Yes	2 No		
iv. Microwave	1 Yes	2 No		
v. Hot plate	1 Yes	2 No		
vi. Radio or Television	1 Radio	2 TV	3 Both	4 None

Ask questions about:

10. Education level of mother	1	2	3	4	5	6
	None	Primary school	Std 6-8	Std 9-10	Tertiary education	Don't know
11. Mother's employment status	1	2	3	4	5	6
	Housewife By choice	Unemployed	Self-employed	Wage earner	Other specify	Don't Know
12. Education level of caregiver	1	2	3	4	5	6
	None	Primary school	Std 6-8	Std 9-10	Tertiary education	Not applicable
13. Father's employment status	1	2	3	4	5	6
	Unemployed	Self-employed	Wage-earner	Retired by choice	Other specify	Not applicable eg. dead

Measure the child.

14. Anthropometry

Weight 1).
2).
3).
Average :

Height: 1).
2).
3).
Average:

In the case where the child is weighed with the mother/caregiver:

Weight of Mother/Caregiver: 1).
2).
3).

Weight of mother/Caregiver and child: 1).
2).
3).

Average difference:

Appendix B: Quantitative food frequency questionnaire (QFFQ)

EATING PATTERNS SURVEY: INDIAN CHILDREN 1-5 YEARS OF AGE IN HOWICK WEST

Subject Number:

Birth date:

Interview Date:

QUANTITATIVE FOOD FREQUENCY QUESTIONNAIRE

Greeting

Thank you for giving up your time to participate in this survey. We would like to find out what children, 1 to 5 years old and living in Howick West, usually eat and drink. This information is important to know as it will tell us if children are eating enough, of the right foods, and if they are healthy.

Please think carefully about the food and drinks the child, that has been identified as a participant in this study survey, has consumed during the past 6 months. I will now go through a list of foods and drinks with you and I would like you to tell me:

- if the child eats these particular foods
- how the food is prepared (by you or the child's caretaker)
- how much of the food the child eats at a time, and
- how many times a day the child eats and if he or she does not every day, how many times a week or a month it is eaten?

To help you describe the amount of a food, I will show you models of different amounts of the food. Please say which model is the closest to the amount eaten, or if it is smaller, between sizes or bigger than the models. Amounts must be reported as cups(c), tablespoons (T), serving spoons (SP) or teaspoons (t).

- **THERE ARE NO RIGHT OR WRONG ANSWERS**
- **EVERYTHING YOU TELL ME IS CONFIDENTIAL**
- **IS THERE ANYTHING YOU WANT TO ASK NOW?**
- **ARE YOU WILLING TO GO ON WITH THE QUESTIONS?**

QUESTION	YES	NO		REMARKS / OTHER
1. Are you the mother of the child?	1	2		If no, please specify your relationship to the child:
2. Is the child being breastfed at present?	1	2		
3. Has the child been breastfed as a baby?	1	2	Don't Know	If yes, for how long? <4mo 4-6mo 7-12mo >1yr 1 2 3 4
4. Does the child presently receive infant formulas?	1	2	Don't know	If yes, specify type: Specify dilution ratio(powder to water)
5. Does the child follow any special diet?	1	2	Don't	If yes, please specify

Appendix C: 24-hour recall questionnaire (24-H-RQ)

EATING PATTERNS SURVEY: INDIAN PRE-SCHOOL CHILDREN 1-5 YEARS OF AGE IN HOWICK WEST – KWA-ZULU NATAL

Subject Number: Birth date: Interview date:

DIETARY INTAKE QUESTIONNAIRE (24 HOUR RECALL)

1. Name of child:													
2. Day of the week recalled							**1 Mon**	**2 Tue**	**3 Wed**	**4 Thu**	**5 Fri**	**6 Sat**	**7 Sun**
3. Was yesterday typical/routine for the child?							1 YES		2 NO IF NOT, WHY?				
4. What kind of fat does the child usually eat on bread?			1 B-3479	2 HM-3484	3 MED-3531	4 PM-3496	5 WF-3516	6 Ghee-3525	7 PB-3485	8 Butro-3523	9 None	10 Other: Specify	
5. What kind of fat does the child usually eat in cooking?	1 B-3479	2 HM-3484	3 MED-3531	4 PM-3496	5 WF-3516	6 Ghee-3525	7 PB-3485	8 Butro 3523	9 SO-3507	10 Canola Oil 4280	11 Olive Oil 3509	12 None	13 Other: Specify
6. What kind of bread does the child usually eat/use?	1 White 3210		2 Brown 3211				3 Whole wheat 3212		5 None				
7. What kind of milk does the child usually drink?	1 CON WM-2714	2 CON SM-2744	3 CON ND-P0042	4 Evap WM-2715	5 Evap SM-2827	6 Evap Lite-P0043	7 ND Creamer-2751	8 WM Powder-2831	9 SM-2719	10 WM-2718	11 BL-2771	12 2% - 2772	13 Longlife SM-2775	14 Soy-2737	15 Breast-2741	16 Goat-2738	17 Formula: Specify	18 None
8. Did the child eat at a feeding scheme or crèche yesterday?	1 YES If YES, specify (fill in p.15)						2 NO						

Instructions:

Now I want you to tell me everything that this child ate and drank yesterday. Lets start with when the child woke up. Did he/she have anything to eat or drink? Proceed through the day following the child's activities. When completed, summarize it for the caregiver. Any forgotten items can then be added.

- **Enter each item eaten in grams under the correct interval of the day eaten.**
- **Make sure that the code is circled.**
- **Items not on the questionnaire should be looked up in the Quantity manual.**
- **Specify fully when new items are entered and look up the code later.**

Appendix D: Consent form

EATING PATTERNS SURVEY IN INDIAN CHILDREN 1-5 YEARS OF AGE IN HOWICK WEST – KWA-ZULU NATAL

CONSENT FORM

ETHICS COMMITTEE REFERENCE NUMBER

DECLARATION BY OR ON BEHALF OF THE PARTICIPANT

I, the undersigned,
.....
[ID ....., participant OR in my capacity as
..... of the participant (child) in the survey
[ID .....] of
.....(address)

A. I confirm that:

1. I/the participant (child) has been asked to participate in the above-mentioned research survey as part of the research project of the Masters in Nutrition course of the Department of Human Nutrition – University of Stellenbosch.

2. It has been explained to me, that:

2.1 The purpose of the research survey is to collect information on what types of foods children between the ages of 1-5 years in Howick West eat. The information collected will be used to determine the intake of various nutrients by these children.

2.2 In order to collect this information I have been told that a number of questions shall be asked regarding the types and amounts of foods the participant (child) eats, and how often these foods are eaten. The participant (child) will also be weighed and his/her height will be measured.

2.3 I have been told that this information will be collected from 50 children in Howick West and I will only be asked these questions once. The measurements on the participant (child) will also be done once.

3. I was told that in order to get the answers to all the questions it will take approximately 2½ hours. I was also told that the measurements on the participant (child) will not cause any pain or harm to the participant (child) in any way.

4. It was also explained to me that by participating in the research survey I will be helping all the children in the country through recommendations for further research.

5. It was also explained to me that the information I will give will be kept confidential but that it will be used anonymously for making known the findings to other scientists.

6. I/the participant (child) can have no direct access to the results of the survey but I can contact the researcher who will inform me of the findings on the participant (child).

7. It was clearly explained to me that I can refuse to participate in this research survey or I can stop answering the questions at any time during the interview. If this was to happen, I will not be disadvantaged in any way and it will not be held against me.

8. The information in this consent consent form was explained to me by Fathima Bux in English and I confirm that I have a good command in this language and understood the explanations. I was also given the opportunity to ask questions on things I did not understand clearly.

9. No pressure was applied to me/the participant (child) to take part in this research survey.

10. Finally, participation in this research survey will have no costs for me/the participant (child).

B. I/the participant (child) hereby agree voluntarily to take part in this research survey.

Signed/confirmed at ..... on 2002

....

Participant's/representative of participant's Signature or hand mark

Witness

DECLARATION BY RESEARCHER

I, Fathima Bux, declare that:

1. I have explained the information in this document to ..... (name of the participant) or his/her representative ..... (*Name of representative*);

2. I asked the participant's representative to ask any questions of clarification, if something was not clear to him/her.

3. That this interview was conducted in English.

4. Mrs Fathima Bux
   Signed at ..... on 2002
   ..... (Signature) .....
   Researcher Witness